Dividing a Whole Number by a Fraction

Find the reciprocal of each fraction or whole number.

1. $\frac{5}{9}$ $\frac{9}{5}$

2. 8 $\frac{1}{8}$

3. $\frac{7}{3}$ $\frac{3}{7}$

Find each quotient. Simplify if possible.

4. $8 \div \frac{2}{5} =$ **20**

5. $4 \div \frac{1}{6} =$ **24**

6. $18 \div \frac{3}{8} =$ **48**

7. $12 \div \frac{1}{2} =$ **24**

8. $42 \div \frac{7}{9} =$ **54**

9. $10 \div \frac{5}{6} =$ **12**

10. $20 \div \frac{3}{4} =$ **$26\frac{2}{3}$**

11. $22 \div \frac{5}{6} =$ **$26\frac{2}{5}$**

12. $7 \div \frac{2}{3} =$ **$10\frac{1}{2}$**

13. $9 \div \frac{1}{8} =$ **72**

14. $15 \div \frac{1}{3} =$ **45**

15. $6 \div \frac{1}{5} =$ **30**

16. **Writing to Explain** Will the quotient of $5 \div \frac{7}{8}$ be greater than or less than 5? Explain.
The quotient will be greater than 5 because you are dividing by a number that is less than 1.

17. **Reasoning** How many times will you need to fill a $\frac{1}{2}$ cup measuring cup to measure 4 cups of flour?
8

18. **Geometry** The distance around a circular flower bed is 36 feet. Jasper wants to put stakes every 8 inches ($\frac{2}{3}$ of a foot) around the bed. How many stakes does he need?
54 stakes

19. **Algebra** Which expression is equal to $9 \times \frac{3}{2}$?

A $2 \div \frac{3}{8}$

B $3 \div \frac{9}{2}$

Ⓒ $9 \div \frac{2}{3}$

D $9 \div \frac{3}{2}$

Dividing Fractions

Find each quotient. Simplify if possible.

1. $\frac{1}{3} \div \frac{5}{6} = $ **$\frac{2}{5}$**

2. $\frac{3}{8} \div \frac{1}{2} = $ **$\frac{3}{4}$**

3. $\frac{7}{8} \div \frac{7}{12} = $ **$1\frac{1}{2}$**

4. $\frac{5}{9} \div 5 = $ **$\frac{1}{9}$**

5. $\frac{6}{7} \div \frac{3}{4} = $ **$1\frac{1}{7}$**

6. $\frac{2}{3} \div \frac{3}{4} = $ **$\frac{8}{9}$**

7. $\frac{1}{2} \div \frac{3}{10} = $ **$1\frac{2}{3}$**

8. $\frac{5}{12} \div \frac{2}{3} = $ **$\frac{5}{8}$**

9. $\frac{14}{15} \div \frac{2}{5} = $ **$2\frac{1}{3}$**

10. $\frac{1}{3} \div \frac{3}{4} = $ **$\frac{4}{9}$**

11. $\frac{3}{8} \div 4 = $ **$\frac{3}{32}$**

12. $\frac{9}{10} \div \frac{3}{5} = $ **$1\frac{1}{2}$**

13. **Writing to Explain** Serena said that by looking for common factors and simplifying the expression, she found that $\frac{4}{10} \div \frac{5}{8} = 1\frac{9}{16}$. Do you agree with Serena? Why or why not?

$\frac{\overset{5}{\cancel{10}}}{4} \times \frac{5}{\underset{4}{\cancel{8}}} = \frac{25}{16} = 1\frac{9}{16}$

No, Serena needs to use the reciprocal of the divisor, not the dividend, when she rewrites the expression as a multiplication expression: $\frac{4}{10} \div \frac{5}{8} = \frac{4}{10} \times \frac{8}{5}$, which can be simplified as $\frac{4}{5} \times \frac{4}{5} = \frac{16}{25}$.

14. A $\frac{5}{6}$-yard piece of fencing is made of boards that are $\frac{1}{12}$ yard wide. How many boards make up the fence?

10 boards

15. Nathan has $\frac{7}{8}$ lb of hummus. How many $\frac{3}{10}$-lb servings does he have?

$2\frac{11}{12}$ servings

16. **Algebra** Which equation can you use to find the number of $\frac{1}{4}$-inch pieces that can be cut from a piece of metal $\frac{5}{8}$ of an inch long?

Ⓐ $\frac{5}{8} \div \frac{1}{4} = n$

B $\frac{1}{4} \div \frac{5}{8} = n$

C $\frac{5}{8} \times \frac{1}{4} = n$

D $\frac{1}{4} \times \frac{8}{5} = n$

Name _____

Understanding Integers

```
    E   B   A     C     D
+--+--+--+--+--+--+--+--+--+--+--+-->
      -5          0          5
```
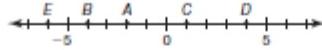
Use the number line. Write the integer for each point. Then give its
opposite and absolute value.

1. A −2, 2, 2   2. B −4, 4, 4   3. C 1, −1, 1

4. D 4, −4, 4   5. E −6, 6, 6

6. On the number line, graph the points −8, 3, −4, 2, and −1.

```
      -8      -4   -1      2 3
+--+--+●--+--+--+●--+--+--+●--+--+●--●--+--+--+--+-->
    -10         -5         0         5         10
```
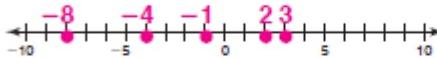
The table gives the highest and lowest
temperatures for some states in the United
States. Use integers to describe the two
temperatures for each state.

**Record Temperatures
(in degrees, relative to zero)**

State	Highest	Lowest
Alabama	112 above	27 below
Delaware	110 above	17 below
California	134 above	45 below
Colorado	118 above	61 below

7. Delaware 110, −17

8. California 134, −45

9. Colorado 118, −61

10. Alabama 112, −27

11. Which is an integer?

   A −0.5

   Ⓑ −5

   C 5.5

   D $5\frac{4}{5}$

12. **Writing to Explain** In your own words, tell what is meant by
"the absolute value of an integer."

Sample answer: The absolute value is
the distance from zero.

Comparing and Ordering Integers

Use <, >, or = to compare.

1. 6 $>$ −8

2. −12 $<$ −11

3. 2 $=$ | −2 |

4. 12 $>$ −11

5. 11 $>$ −1

6. | −3 | $<$ 4

Order from least to greatest.

7. −6, 4, 7, 0, −9 $-9, -6, 0, 4, 7$

8. −1, −5, 5 , 7, −8 $-8, -5, -1, 5, 7$

9. −7, −8, −2, 6, | −11 |, −11, −9, 4, 5

$-11, -9, -8, -7, -2, 4, 5, 6,$ | -11 |

10. **Reasoning** Can any negative integer be greater than a positive integer? Explain.

No; Sample answer: All negative numbers are less than zero and all positive numbers are greater than zero.

Kyle kept track of the number of points he scored each time he played a video game. Sometimes the score is less than zero.

Kyle's Scores	
Play 1:	Gained 5 points
Play 2	Lost 15 points
Play 3:	Gained 32 points
Play 4:	Gained 10 points
Play 5:	Lost 12 points
Play 6:	Lost 8 points

11. Order the negative plays from least to greatest.

−15, −12, −8

12. Order the positive plays from greatest to least.

32, 10, 5

13. Which integer is greatest?

A 1   B −10   C 9   D 3

14. **Writing to Explain** Explain how to find the greatest integer plotted on a number line.

Sample answer: Find the integer that is the farthest to the right.

Adding Integers

1. Draw a number line to find $3 + (-4)$.
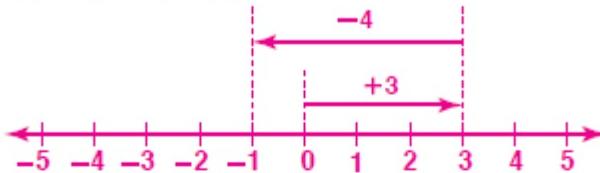
Find each sum. Use a number line or the rules for adding integers.

2. $4 + (-12) = $ __−8__

3. $-12 + (-14) = $ __−26__

4. $10 + (-1) = $ __9__

5. $-2 + (-1) = $ __−3__

6. $-50 + (-1) = $ __−51__

7. $8 + (-4) = $ __4__

8. $-9 + 7 = $ __−2__

9. $-3 + (-6) = $ __−9__

Algebra Use the rule to complete each table.

10. **Rule: Add -6**

Input	Output
5	−1
3	−3
−1	−7

11. **Rule: Add 2**

Input	Output
−7	−5
−4	−2
0	2

12. Which is the sum of $-6 + (-9) + (-9)$?

(A) −24

B −12

C −6

D 24

13. **Writing to Explain** Explain how you would solve $-4 + 4 + 5$.

Sample answer: −4 and 4 are opposites, so they add to 0. $0 + 5 = 5$

Subtracting Integers

For **1** through **3** use the number line below to find each difference.
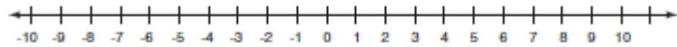
1. $5 - 10$
  –5

2. $-4 - 4$
  –8

3. $6 - (-3)$
  9

For **4** through **9**, use a number line or the rules for adding integers to find each difference.

4. $-6 - (-1)$
  –5

5. $-12 - 10$
  –22

6. $25 - (-5)$
  30

7. $14 - 22$
  –8

8. $7 - |-6|$
  1

9. $|-2| - |2|$
  0

For **10** through **12**, evaluate each expression for $m = -5$.

10. $52 - m$
  57

11. $m - (-15)$
  10

12. $18 - |-3| - m$
  20

13. Writing to Explain Explain when you use the word "minus" and when you use the word "negative." Give an example.

Use minus to show the operation of subtraction. Use negative to show numbers less than zero.
~~**Example: 9 minus negative 3: 9 – (–3)**~~

14. Number Sense Ben's first score on a video game was 12. His second score was −15. Which expression can he use to find how many more points he got in the first game?

A $-12 + 15$

B $12 - 15$

C $12 + -15$

Ⓓ $12 - (-15)$

Multiplying Integers

1. $(-8)(-2) =$ **16**

2. $7 \times (-10) =$ **−70**

3. $5 \times 3 =$ **15**

4. $(-9)(-6) =$ **54**

5. $(-6)(-3) =$ **18**

6. $3 \times (-18) =$ **−54**

7. $-9 \times -41 =$ **369**

8. $(-6)(-21) =$ **126**

Number Sense Use order of operations to evaluate each expression.

9. $(-3) + 5 + 4 - 9 \times 3 =$ **−21**

10. $(-6) - 4 \times 8 + 11 \times 2 =$ **−16**

Algebra Evaluate each expression when $r = 8$.

11. $-12r - 120 =$ **−216**

12. $7r + -5 =$ **51**

13. $(-4r)(-30) - (-8) =$ **968**

14. $(-2r)(8) + (-25) =$ **−153**

15. From 1950 to 1970, some glaciers thinned by an average of 1.7 ft per year. What was the change in glacier thickness during this period?   **−34 ft**

16. From 1995 to 2000, the glaciers thinned by 6 ft per year. What was the change in glacier thickness during this period?   **−30 ft**

17. Which is the product of $(-4)(-12)$?

   A −48

   B −36

   C 36

   (D) 48

18. **Writing to Explain** Explain how to evaluate $5p + (-6)$ when $p = -4$.

   Sample answer: Insert the value of p into the expression to find $5(-4) + (-6)$ $= -20 + (-6) = -26$.

Dividing Integers

Find each quotient.

1. $80 \div (-8)$
-10

2. $-75 \div (-5)$
15

3. $-49 \div 7$
-7

4. $-45 \div (-9)$
5

5. $0 \div (-14)$
0

6. $-81 \div (-3)$
27

Use order of operations to evaluate each expression for $c = -8$.

7. $-96 \div c$
12

8. $c \div 4$
-2

9. $-144 \div c$
18

10. $13 - (c \div 2)$
17

11. $(3c + 4) \div 5$
-4

12. $c \div (-4) + 6$
8

13. **Reasoning** Is $120 \div -6 \times -3$ positive or negative? Explain.
Positive. Sample answer: Since the quotient of 120 and -6 is a negative integer and then you multiply the negative integer by a negative integer, the result is positive.

14. **Algebra** A roller coaster dropped 224 feet in 2 seconds. What was the rate of change in height per second? Find $-224 \div 2$.
-112 feet per second

15. What is the quotient of $-162 \div (-9)$?

   A -18

   B -16

   C 16

   (D) 18

16. **Writing to Explain** Jill says that the rules for multiplying and dividing integers are alike. Do you agree? Explain.
Sample answer: Yes, finding the sign of the product and the quotient are alike because two integers with like signs have a positive product or quotient and two integers with different signs have a negative product or quotient.

Solving Equations with Integers

Solve and check each equation.

1. $y - (-6) = -6$

    $y = \underline{-12}$

2. $\frac{-80}{t} = 8$

    $t = \underline{-10}$

3. $-4w = -80$

    $w = \underline{20}$

4. $u - (-96) = 2$

    $u = \underline{-94}$

5. $55 + h = -7$

    $h = \underline{-62}$

6. $n \div -9 = -9$

    $n = \underline{81}$

7. $x + (-8) = -15$

    $x = \underline{-7}$

8. $-21c = 21$

    $c = \underline{-1}$

Reasoning Without solving, tell whether the variable is greater than, less than, or equal to −15. Tell how you decided.

9. $p + 14 = 2$

    Greater than; $-14 + 14 = 0$,

    so $p > -14$, so $p > -15$.

10. The temperature at 3:00 P.M. was −5°F. The temperature 1 hour later was −8°F. Solve the equation $-5 + d = -8$ to find the change in temperature.

    $\underline{-3° \text{ F}}$

11. A climber reached 2,500 feet up a mountain. Over the next 3 hours, she descended 600 feet down the mountain. Solve the equation $3y = -600$ to find the number of feet she descended per hour.

    $\underline{-200 \text{ ft}}$

12. Which is the value of s in $s - (-87) = -120$?

    Ⓐ −207   **C** 33

    B −33   **D** 207

13. **Writing to Explain** Write an equation in which the variable g stands for a negative integer. Then solve the equation for g.

    Sample answer: $g - 8 = (-14)$; $g = -6$

Graphing Points on a Coordinate Plane

Write the ordered pair for each point.

1. F **(−3, 2)**   2. G **(−1, 0)**

3. H **(−2, −3)**   4. I **(−1, −4)**

5. J **(3, −3)**   6. K **(4, 2)**

For **7** through **9**, graph the ordered pairs. Connect the points in order and describe the figure you drew.

7. (1,0), (5,0), (5, 4), (1,4)

Square

8. (0, 0), (2,−4), (−2, −4)

**Isosceles triangle**

9. (−4, −2), (−2, −2), (−2, 5), (−4, 5)

Rectangle

10. **Writing to Explain** A point is located in Quadrant IV. What do you know about the signs of the coordinates for the point? Explain.

Quadrant IV is the lower right quadrant. If a point is in Quadrant IV, the x-coordinate is positive and the y-coordinate is negative (x, −y).

11. **Critical Thinking** Draw three lines that are parallel to the x-axis. Read the ordered pairs for points on each line. What generalization can you make about the ordered pairs for lines parallel to the x-axis?
The y-coordinate is the same for all points on a line parallel to the x-axis.

12. **Geometry** Which set of ordered pairs can be connected in order to form a right triangle?

Ⓐ (−1, 3), (−1, −1), (2, −1)

B (−4, 0), (0, 1), (1, −2)

C (2, 2), (2, −2), (−2, −2), (−2, 2)

D (0, 5), (−3, 3), (3, −3)
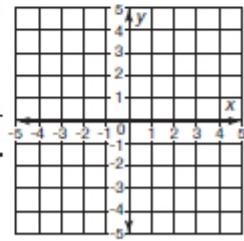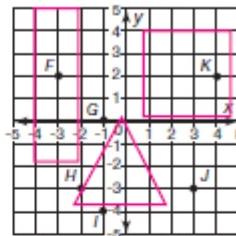
Understanding Ratios

A string quartet consists of 2 violins, 1 viola, and 1 cello. Write a ratio for each comparison in three ways.

1. violins to cellos   **2:1; 2 to 1; $\frac{2}{1}$**

2. cellos to violas   **1:1; 1 to 1; $\frac{1}{1}$**

3. violins to all instruments   **2:4; 2 to 4; $\frac{2}{4}$**

4. **Number Sense** How are the ratios in Exercises 1 and 2 different from the ratio in Exercise 3?

   The ratios in Exercises 1 and 2 are comparing parts to parts; the ratio in Exercise 3 compares a part to a whole.

Midland Orchards grows a large variety of apples. The orchard contains 12 rows of Granny Smith trees, 10 rows of Fuji trees, 15 rows of Gala trees, 2 rows of Golden Delicious trees, and 2 rows of Jonathan trees. Write each ratio in three ways.

5. rows of Granny Smith trees to rows of Golden Delicious trees   **12:2; 12 to 2; $\frac{12}{2}$**

6. rows of Fuji trees to the total number of rows of trees   **10:41; 10 to 41; $\frac{10}{41}$**

7. A grade school has 45 students who walk to school and 150 students who ride the bus. The other 50 students are driven to school. Which shows the ratio of students who walk to school to the total number of students in the school?

   A 45:50   **B** 45:195   **C** 45:150   **(D)** 45:245

8. **Writing to Explain** Steve said it does not matter which term is first and which term is second in a ratio, since ratios are different than fractions. Is he correct? Explain why or why not.

   No; It does matter. If the terms are reversed, then a different comparison is being made.

Understanding Rates and Unit Rates

Write the rate and the unit rate.

1. 42 bricks laid in 2 hours
$$\frac{42 \text{ bricks}}{2 \text{ hours}}, \frac{21 \text{ bricks}}{1 \text{ hour}}$$

2. 15 points scored in 4 quarters
$$\frac{15 \text{ points}}{4 \text{ quarters}}, \frac{3.75 \text{ points}}{1 \text{ quarter}}$$

3. 225 chairs in 15 rows
$$\frac{225 \text{ chairs}}{15 \text{ rows}}, \frac{15 \text{ chairs}}{1 \text{ row}}$$

4. 24 trees pruned in 5 days
$$\frac{24 \text{ trees}}{5 \text{ days}}, \frac{4.8 \text{ trees}}{1 \text{ day}}$$

5. 480 miles in 12 hours
$$\frac{480 \text{ miles}}{12 \text{ hours}}, \frac{40 \text{ miles}}{1 \text{ hour}}$$

6. $6.50 for 10 pounds
$$\frac{\$6.50}{10 \text{ lbs}}, \frac{\$0.65}{1 \text{ lb}}$$

7. 72 plants in 9 square feet
$$\frac{72 \text{ plants}}{9 \text{ sq ft}}, \frac{8 \text{ plants}}{1 \text{ sq ft}}$$

8. 357 miles on 14 gallons
$$\frac{357 \text{ miles}}{14 \text{ gal}}, \frac{25.5 \text{ miles}}{1 \text{ gal}}$$

9. **Estimation** Over 5 days, 8,208 people visited an amusement park. About how many people visited the park per day?

    About 1,600 per day

10. **Writing to Explain** Explain how you could convert a rate of 18,000 miles per hour to miles per second.

    Divide 18,000 by 60 to get miles per minute, $18,000 \div 60 = 300$ miles per minute. Then divide 300 by 60 to get miles per second, $300 \div 60 = 5$ miles per second.

11. **Critical Thinking** Matt makes 5 bookcases in 8 days. What is his unit rate?

    0.625 bookcases per day

12. A space shuttle orbits Earth 1 time in 90 minutes. How many times does it orbit Earth in 6 hours?

    4 times

13. Which is the unit rate for 39 people in 3 vans?

    A 39 people per van

    B 13 vans per person

    Ⓒ 13 people per van

    D 3 people per van

Comparing Rates

Find each unit rate and determine which rate is greater.

1. 250 mi per 10 gal or 460 mi per 20 gal

$\frac{25 \text{ mi}}{1 \text{ gal}}$; $\frac{23 \text{ mi}}{1 \text{ gal}}$; **250 mi per 10 gal is greater.**

2. 1,000 words in 20 min or 2,475 words in 45 min

$\frac{50 \text{ words}}{1 \text{ min}}$; $\frac{55 \text{ words}}{1 \text{ min}}$; **2,475 words in 45 min is greater.**

3. 6 in. of rain in 4 h or 8 in. of rain in 5 h

$\frac{1.5 \text{ in.}}{1 \text{ h}}$; $\frac{1.6 \text{ in.}}{1 \text{ h}}$; **8 in. of rain in 5 h is greater.**

Find each unit price and determine which is a better buy.

4. 1 lb of apples for $2.15 or 3 lb of apples for $5.76

$\frac{\$2.15}{1 \text{ lb}}$; $\frac{\$1.92}{1 \text{ lb}}$; **3 lb for $5.76 is the better buy.**

5. 8 bungee cords for $10.00 or 20 bungee cords for $22.00

$\frac{\$1.25}{1 \text{ cord}}$; $\frac{\$1.10}{1 \text{ cord}}$; **20 cords for $22.00 is the better buy.**

6. 5 oz of insect repellant for $6.95 or 14 oz of insect repellant for $19.60

$\frac{\$1.39}{1 \text{ oz}}$; $\frac{\$1.40}{1 \text{ oz}}$; **5 oz for $6.95 is the better buy.**

7. Fritz earns $75.60 for each 7-h shift that he works. Which shift pays a higher hourly wage than the wage Fritz earns?

   A $60.30 for a 6-h shift

   B $80.00 for an 8-h shift

   Ⓒ $36.30 for a 3-h shift

   D $40.40 for a 4-h shift

8. **Writing to Explain** Shaunda said that buying 4 towels for $17 was a better buy than buying 2 towels for $9. She found her answer by doubling the terms in the ratio $\frac{9}{2}$ and comparing the first terms in the ratios. Is she correct? Use unit prices to support your answer.

   Yes, the unit price for 2 towels for $9 is $4.50 per towel, and the unit price for 4 towels for $17 is $4.25 per towel. Since $4.25 < $4.50, the 4 towels for $17 are a better buy.

Understanding Percent

Write the percent of each figure that is shaded.

1.

81%

2.

24%

3.

60%

4.
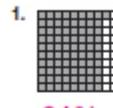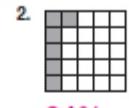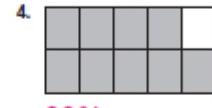
90%

5. **Number Sense** What percent of line segment *AB* is equal to 50% of line segment *CD*?

A ——— B

C ——————— D
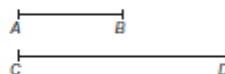
100%

6. The line segment below shows 100%. Show 25%, 50%, and 75% of the segment.

25%   50%   75%

X ———————————— Y

7. Which of the following figures is 60% shaded?

Ⓐ   B   C   D

8. **Writing to Explain** You are thirsty, so a friend has offered to give you 50% of his water. What information must you have in order to find out how much water your friend will give you?

Sample answer: The total amount of

water your friend has

Fractions, Decimals, and Percents

Describe the shaded portion of each as a fraction, decimal, and percent.

1.

$\frac{43}{100}$, 0.43, 43%

2.
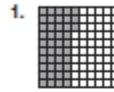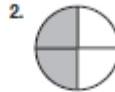
$\frac{2}{4}$, 0.5, 50%

Write each in two other ways.

3. 64%
0.64, $\frac{64}{100}$

4. 0.09
9%, $\frac{9}{100}$

5. $\frac{12}{50}$
24%, 0.24

6. 37%
$\frac{37}{100}$, 0.37

7. $\frac{4}{250}$
0.016, 1.6%

8. 0.023
$\frac{2.3}{100}$, 2.3%

The table at the right shows the number of states in the United States at different times in history. There are currently 50 states in the United States. Use the information to answer the questions.

Year	States
1792	15
1817	20
1836	25
1848	30
1863	35
1889	40
1896	45
1959	50

9. In what year were there 0.5 as many states as today?

1836

10. What percent of the current number of states had joined the United States by the year 1863?

70%

11. In what year were there about $\frac{2}{3}$ as many states as in 1896? 1848

12. Which of the following is equivalent to 98%?

A 0.49   **B** $\frac{100}{98}$ **C** 0.98   **D** $\frac{49}{100}$

13. Writing to Explain Explain how you would write $\frac{5}{6}$ as a percent.

Sample answer:
I would use a proportion: $\frac{5}{6} = \frac{x}{100}$.

Finding the Percent of a Number

Find the percent of each number.

1. 42% of 800   **336**   2. 5.6% of 425   **23.8**   3. 85% of 15   **12.75**

4. 33⅓% of 678   **226**   5. 12% of 65   **7.8**   6. 58% of 324   **187.92**

7. 98% of 422   **413.56**   8. 32% of 813.5   **260.32**   9. 78% of 219   **170.82**

10. 13% of 104   **13.52**   11. 24% of 529   **126.96**   12. 4.5% of 82   **3.69**

13. 64% of 912   **583.68**   14. 128% of 256   **327.68**   15. 63% of 1,368   **861.84**

16. About 42% of the flag of the United States is red. On a flag that is 9 feet tall and 15 feet wide, how many square feet are red?

    Sample answer: Estimate: 24;

17. **Estimation** Estimate 68% of 32, then find the actual answer. Which is greater?

    Actual: 21.76; Estimate is greater.

For **18** and **19**, round your answer to the nearest whole number.

18. An adult has 206 bones. Of those, approximately 2.9% are found in the inner ear. About how many bones in the human body are found in the inner ear?

    6 bones

19. Approximately 12.6% of the bones are vertebrae in the human back. About how many bones in the human body are vertebrae?

    26 bones

20. 45 is 12% of which number?

    A 540   **B** 450   Ⓒ 375   **D** 5.4

21. **Writing to Explain** Without calculating, tell which is greater, 52% of 3,400 or 98% of 1,500. Explain.

    52% of 3,400 is greater. About half of 3,400 is greater than about all of 1,500.

Equations with More Than One Operation

1. $12a + 24 = 48$ $a = 2$

2. $4z - 8 = 32$ $z = 10$

3. $\frac{x}{5} - 10 = 2$ $x = 60$

4. $\frac{p}{3} + 6 = 42$ $p = 108$

5. $5b + 15 = 30$ $b = 3$

6. $7n + 14 = 21$ $n = 1$

7. $\frac{c}{4} + 3 = 5$ $c = 8$

8. $\frac{q}{2} - 4 = 18$ $q = 44$

9. $17 + 3y = 38$ $y = 7$

10. $\frac{m}{4} - 17 = 4$ $m = 84$

11. $\frac{c}{12} + 12 = 21$ $c = 108$

12. $8z - 13 = 7$ $z = 2.5$

For **13** and **14**, write and solve an equation.

13. Yoshi's age is twice Bart's age plus 3. Yoshi is 13 years old. How old is Bart?

$13 = 2b + 3;$
$b = 5$

14. Caleb and Winona both travel by car to their friend's home. The distance Winona traveled was 124 miles less than twice the distance Caleb traveled. If Winona traveled 628 miles, how far did Caleb travel?

$628 = 2c - 124;$
$c = 376$

15. **Critical Thinking** Explain the mistake in this solution and find the correct solution.

$$6x + 15 = 69$$
$$6x = 84$$
$$x = 14$$

Added 15 to the right side and subtracted 15 from the left side instead of subtracting 15 from both sides. $x = 9$

16. **Number Sense** Which is the value of n when $4n + 16 = 64$?

A $n = 4$ **B** $n = 8$ **Ⓒ** $n = 12$ **D** $n = 16$

17. **Writing to Explain** Explain how to solve the equation $6x - 3 = 39$.

First add 3 to each side of the equation to get $6x = 42$. Then divide both sides by 6 to get $x = 7$.

More Patterns and Equations

In **1** through **4**, use the equation given to complete each table.

1. $y = 2x + 4$

x	0	1	2	3
y	4	6	8	10

2. $y = 4x - 3$

x	-2	0	2	4
y	-11	-3	5	13

3. $y = 100 - 4x$

x	2	4	6	8
y	92	84	76	68

4. $y = \frac{1}{3}x + 1$

x	-3	0	3	6
y	0	1	2	3

5. Writing to Explain Complete the table and write an equation for the pattern. Tell how you do it.
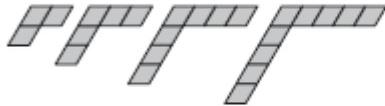
Pattern Number, p	1	2	3	4
Number of Blocks, b	3	5	7	9

Sample answer:
Two blocks are added for each new figure, so I wrote that as 2p. Then for the corner block, I added 1, so the equation is b = 2p + 1

6. Algebra How many blocks are needed to make the 10th figure in the pattern above?

A 11   B 20   Ⓒ 21   D 22

7. Reasoning Justin used 35 blocks to make a figure for the pattern above. What was the pattern number for the figure? __17__

8. Write a Problem Write a problem that can be represented by this equation and table.

$y = 20x + 5$

x	1	2	3	4
y	25	45	65	85

Sample answer:
A florist charges $20 a dozen for roses plus a $5 delivery fee.

Graphing Equations

For **1** and **2**, make a T-table. Then graph each equation.

1. $y = x - 3$

x	y
−2	−5
−1	−4
0	−3
1	−2

2. $y = -2x$

x	y
−2	4
−1	2
0	0
1	−2
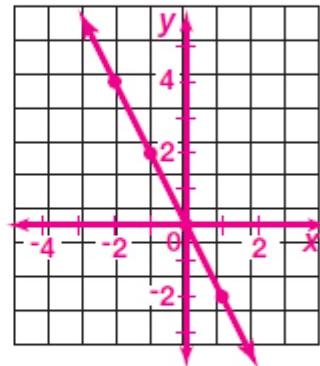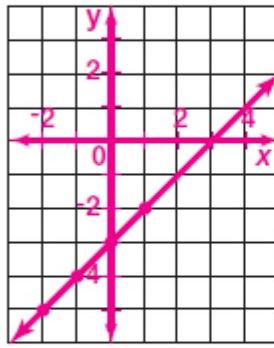
3. Reasoning Is the point (5, 6) on the graph for the equation $y = -2x + 5$?

No

4. Which point is on the graph for the equation $y = -14 + x$?

A (1, 5)

B (2, 12)

Ⓒ (−2, −16)

D (−7, 21)

5. Writing to Explain Explain how making a T-table helps you graph an equation.

Sample answer: Using a T-table provides the coordinates needed to graph the equation.

# Graphing Equations with More Than One Operation

For **1** and **2**, make a T-table and graph each equation.

1. $y = 3x - 5$ **Sample answers in table.**

x	y
0	−5
2	1
3	4

2. $y = 2x + 2$ **Sample answers in table.**

x	y
0	2
−1	0
2	6
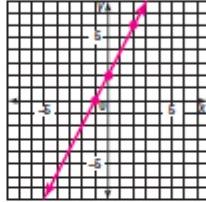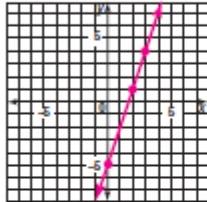
3. Which equation is shown by the graph?

(**A**) $y = 2x - 1$

B $y = x - 1$

C $y = 2x + 1$

D $y = x + 1$
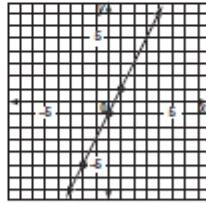
4. Writing to Explain Carrie says that one solution to $y = 3x - 5$ is (4, 7). Describe two ways to check if her statement is true. Use at least one way to check her answer.

Sample answer: Solve the equation or graph the equation and check that the ordered pair is on the graph: 3 × 4 − 5 = 12 − 5 = 7. The point is also on the graph in Exercise 1. So it checks.

Converting Customary Measures

Complete.

1. 3.5 ft = **42** in.
2. 17 yd = **51** ft
3. 1.5 gal = **24** c
4. 4 mi = **21,120** ft
5. 160 fl oz = **5** qt
6. 72 in. = **6** ft
7. 3 mi = **5,280** yd
8. 12 pt = **6** qt
9. 180 ft = **60** yd
10. 2 gal = **256** fl oz

11. How many tons are in 35,000 lb? **17.5**

12. **Number Sense** Brian pole vaulted over a bar that was 189 in. high. How many more inches would he need to vault to go over a bar that was 16 ft high?

3 more inches

A paving company was hired to make a 4 mile section of the highway. They need 700 tons of concrete to complete the job.

13. How many yards of highway do they need to repave?

7,040 yd

14. How many pounds of concrete will they need to repave the highway?

1,400,000 lb

15. Gary's cat weighs 11 lb. How many ounces is that?

A 132   B 144   C 164   **D** 176

16. **Writing to Explain** The average car manufactured in the United States in 2001 could drive 24.5 mi on 1 gal of gas. Explain how to find the number of yards the car can travel on 1 gal of gas.

Sample answer: To find the answer, multiply 24.5 by the number of yards in a mile (1,760): 24.5 × 1,760 = 43,120.

Converting Metric Measures

Name the most appropriate metric unit for each measurement.

1. mass of a paperclip   **Gram**

2. capacity of a water cooler   **Liter**

3. width of a sheet of paper   **Centimeter**

Complete.

4. 2.7 m = **270** cm   5. 1.6 kg = **1,600** g

6. 9 L = **9,000** mL   7. 14 m = **14,000** mm

8. 1.6 cm = **16** mm   9. 5,400 g = **5.4** kg

10. 1,840 mL = **1.84** L   11. 32 km = **32,000** m

12. **Number Sense** The chemist needs 2,220 mL of potassium chloride to complete an experiment. He has 2 L. Does he have enough to complete the experiment? Explain.

No; 2 L is only 2,000 mL.

13. A computer floppy disk has a mass of 20 g. How many would you need to have a total mass of 1 kg?

50 disks

14. A battery is 5 cm long. How many batteries would you need to line up to get 3 m?

60 batteries

15. Which would you do to convert 25 cm to millimeters?

A   Divide by 10   C Multiply by 10

B   Divide by 100   D Multiply by 100

16. **Writing to Explain** A banana has a mass of 122 g. Explain how to find the mass of the banana in milligrams.

Sample answer: 1 g = 1,000 mg, so multiply by 1,000 (122 × 1,000 = 122,000 mg).

Mean, Median, Mode, and Range

Find the mean, median, mode, and range of each data set. Round the decimal answers to the nearest hundredth.

1. 4, 6, 4, 5, 2, 3, 6, 7, 4   **4.56; 4; 4; 5**

2. 0.6, 0.9, 0.5, 0.3, 0.6, 0.4   **0.55; 0.55; 0.6; 0.6**

3. 32 mL, 42 mL, 88 mL, 35 mL, 40 mL, 73 mL, 88 mL, 17 mL

   51.88 mL; 41 mL; 88 mL; 71 mL

4. If you told someone that the greatest depth in Lake Superior was 1,333 ft, would you be expressing a number similar to mode, median, mean, or range?

   Sample answer: The depth of the lake is

   an example of range.

The chart shows the number of keys on several different kinds of musical instruments with keyboards.

5. To the nearest whole number, find the mean in the number of keys listed for each instrument.

   81

Instrument	Keys
Average spinet piano	88
Hammond organ	122
Clavichord	60
Harpsichord	48
Average grand piano	88

6. For this data set, which is greater, the median or the mode?

   Neither, they are equal.

7. The mean of a batting average of a baseball player for 5 years was .281. Four of his batting averages were .301, .299, .287, and .243. What was the fifth average?

   A .303   C .281

   B .286   **(D)** .275

8. **Writing to Explain** Sheila said that in any data set, the median and the mean are always very similar in value. Is she correct? Explain.

   No; Sample answer: The median and mean can

   vary greatly depending on the data set.

Frequency Tables and Histograms

Conrad recorded the number of hours he spent on the Internet for two weeks. He made a frequency table of the data. Use the table for 1 through 2.

| Hours on the Internet	
Hours	Frequency
0–4	2
5–9	3
10–14	7
15–19	0
20–24	0
25–29	2

1. What is the mode of the data? Explain.
   10–14 hours; sample answer: The mode is the interval with the most data values and this interval has the most values with 7.

2. How many days did Conrad spend 9 hours or less on the Internet? Explain.
   5 days; sample answer: There are 2 days in the 0–4 range and 3 days in the 5–9 range, for a total of 5 days in the 0–9 hour range.

Use the information below for 3 through 5.

Ages of Players at Castle Miniature Golf				
14	7	6	24	15
9	19	25	10	17
51	8	21	48	12

Ages of Players at Castle Miniature Golf
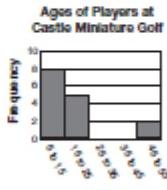
3. How many of the players are over 25? Explain.
   2: sample answer: There are no players in the 26 to 45 age range and only 2 in the 46 to 55 age range.

4. Where do most of the data in the histogram cluster?
   (A) 6–15   C 26–55
   B 16–25   D Over 15

5. **Writing to Explain** Explain how you can tell whether a histogram has an outlier.
   Sample answer: Look for a gap in the histogram; if the gap precedes or follows an interval, the interval is an outlier since an outlier is a value that is much greater or less than other values in the data set.